Chapter 5:
Synthesis and Applications

This chapter brings together concepts discussed previously and gives an overview of crime mapping applications in selected areas of criminal justice.

Synthesis 2000

What are the most obvious characteristics of crime mapping at the beginning of the new millennium? Several come to mind:

Technology imbalance—most police departments, except large ones (more than 100 sworn officers), do *not* use crime mapping technology.

Urban, suburban, and rural differences—in terms of crime analysis and mapping, the perspectives and needs of urban, suburban, and rural police departments greatly differ.

Incomplete geocoding—efforts to geocode rural addresses are under way.

Geographic information system (GIS) functions—GIS is used for *descriptive*, *analytical*, and *interactive* purposes.

GIS mapping—GIS is used to represent information in the form of *points*, *areas (polygons)*, and *lines*.

Decreasing costs—more capabilities become available as the cost of mapping technology declines.

Crossjurisdiction alliances—these relationships recognize that criminal behavior pays little heed to departmental boundaries.

Theory and practice—the link remains weak.

Data sharing—collaboration among State and local agencies is becoming more common.

Context—the "backdrop" is increasingly being recognized as critical to understanding crime patterns and crime prevention.

Privacy issues—these issues become more urgent as the ability of law enforcement agencies (and others) to link information to addresses and individuals increases.

Public access—access to geographic information increases with the use of the Web and systems such as ICAM (Information Collection for Automated Mapping) in Chicago.

Let's consider each point in turn.

Technology imbalance. Why are most police departments not using computerized crime mapping? (Only 13 percent reported using the technology in the 1997–98 survey by Mamalian and La Vigne et al., 1999.) Part of the answer lies in the very different needs and capabilities of urban, suburban, and rural law enforcement agencies. The needs and resources of large urban departments make computer crime mapping practical. Crime rates, particularly in so-called inner cities with larger police departments, are generally higher than in suburban or rural areas. A larger police force also means that tasks can be more specialized and that the probability of having a staff dedicated to crime analysis is greater. The political map is extremely fragmented in some areas, such as Los Angeles and Chicago, with numerous small, incorporated communities outside the central city. While the total population in such metropolitan areas may be large and the crime problems significant, political fragmentation decreases the likelihood that police departments are, individually, able to deploy specialized crime analysis units.

Urban, suburban, and rural differences. Reasons for variations in the use of automated mapping go beyond the size of police departments and questions of labor force specialization. Urban, suburban, and rural environments differ fundamentally in a number of ways that relate to the distribution of crime (Mazerolle, Bellucci, and Gajewski, 1997). Among the obvious differences are those relating to population density, racial and ethnic diversity, social cohesion, and economic health. Higher population density means more potential for crime in a given area. This does not necessarily mean higher crime rates, however. A rural county may have a higher population-based crime rate compared with a city, but the city has more crimes due to its having a larger population.

Urban law enforcement differs markedly from that in rural areas, where communities and residences may be widely separated.

Rural policing may be just as fragmented as urban policing. Each small town may have its own police department with a handful of officers, while the surrounding area may be the responsibility of the sheriff or State police. (To add to the confusion, in large cities sheriffs are not necessarily involved in street-level criminal law enforcement but may act as officers of the court, dealing with court orders, evictions, repossessions, and, perhaps, jail administration.)

Paradoxically, perhaps, response times to calls for service (CFS) for the responsible agency in a low-density rural area may be much longer than from its neighbor, depending on the locations of police facilities. Concepts like *patrol* that are the bedrock of urban and suburban law enforcement mean little in an environment like that illustrated in figure 5.1. *Response time*, too, must be thought about differently. It is easy to overlook law enforcement environments that are nonmetropolitan, since the problems that attract most attention are in urban locations, as are the media. Furthermore, the literature on GIS in policing is almost exclusively dedicated to urban case studies. Because the application of GIS to low-density suburbs and rural environments is a new frontier and has been extremely limited, hard questions need to be asked: Does rural law enforcement really need computer mapping? Can GIS improve rural policing?

Incomplete geocoding. Historically, geocoding efforts have had a distinctly urban bias, for obvious reasons. The majority of people lived in the cities, and the census enshrined urban geocoding by linking early address matching initiatives to the areas that we know today as Metropolitan Areas. Rural areas were essentially impossible to geocode because their rural route and post office (P.O.) box addresses inhibited the construction of links to the locations of housing units or businesses. Preparations for Census 2000 include an aggressive effort to geocode rural addresses. In some cases, 911 street addresses are already available (typically

Figure 5.1.

A photograph of a low-density environment in the Oklahoma panhandle. In this rectangular land survey grid area, directions refer to miles and compass directions. Privacy has a different meaning than in high-density urban areas. On a map representing this low-density area, a dot could easily be linked to a specific household, in sharp contrast to high-density urban environments.

Source: Keith Harries.

in the rural parts of metropolitan counties). In other cases, field workers go out and record the locations of structures and reconcile them to their rural route or P.O. box number, if possible. This effort is essentially a cooperative venture among local governments, the U.S. Census Bureau and the U.S. Postal Service.[1]

GIS functions. The uses of GIS in policing can be characterized as descriptive, analytical, and interactive. Descriptive maps can be equated with traditional cartography in that they tend to be a static picture of information, albeit a very useful one, as exemplified by the styles shown in figures 5.2, 5.3, and 5.4. Descriptive is not a pejorative term—it is the foundation of scientific investigation. Accurate description is an extremely valuable commodity easily capable of providing answers to questions. Accurate and timely description is the foundation on which GIS rests.

Analytical maps go a step further and consider relationships among map elements or use methods based on spatial statistics software, such as STAC (Spatial and Temporal Analysis of Crime) or the ArcView® Spatial Analyst. In interactive mapping, the analyst enters and changes map parameters "on the fly," perhaps testing theories about fluctuating drug-market boundaries, studying the displacement effects of a crackdown, or examining how buffering features may affect outcomes. (For examples of analytical maps, see figures 5.7 and 5.9. For an example of what was originally an interactive animated map, see figure 6.8.)

GIS mapping. The predominant applications of GIS have involved the representation of point, area (polygon), and line data for reasons that have been outlined previously. However, as databases become more integrated and newer technologies

Figure 5.2

A map showing a burglary pattern for a specific time period in a specific neighborhood in Tempe, Arizona.

Source: Rachel Boba and the Tempe, Arizona, Police Department. Reproduced by permission.

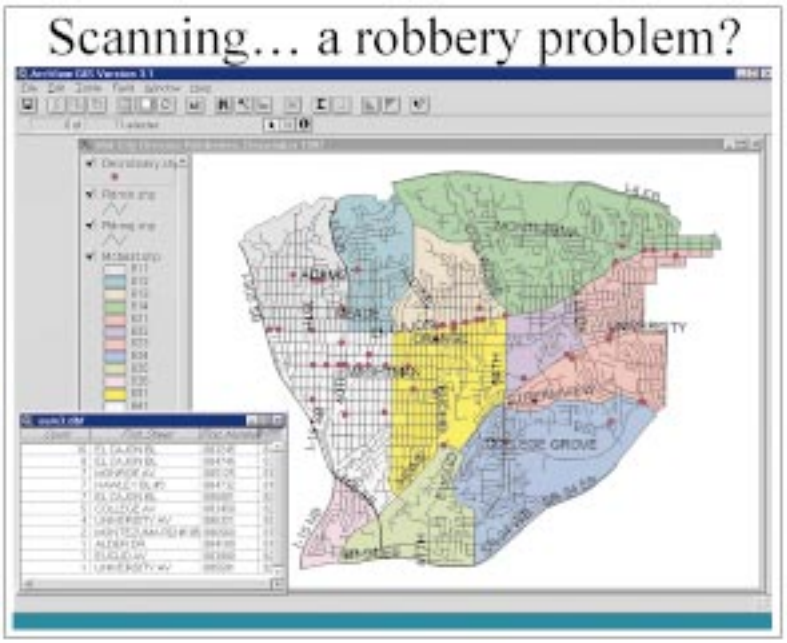

Figure 5.3

A map showing a scan of the robbery problem in specific neighborhoods in San Diego, California.

Source: Julie Wartell and the San Diego, California, Police Department. Reproduced by permission.

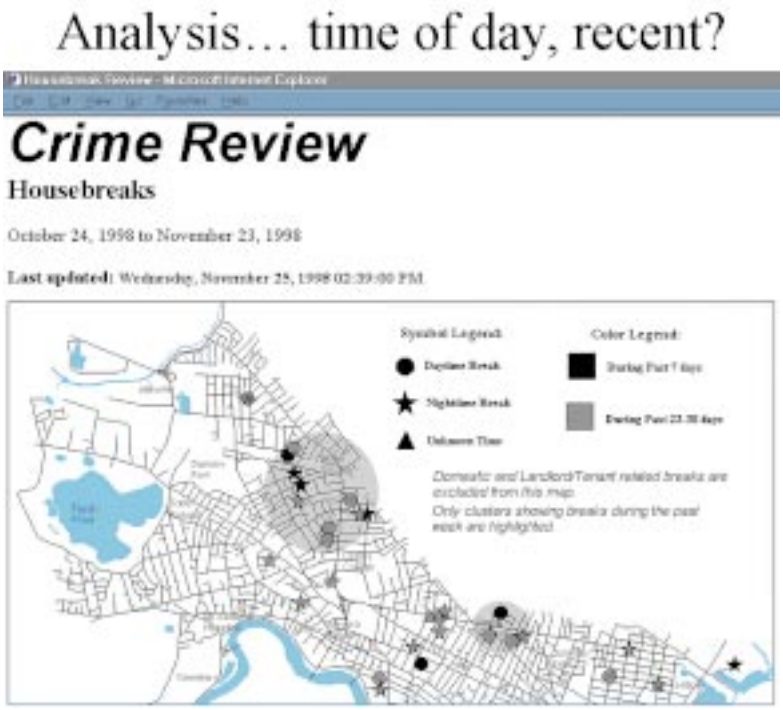

Figure 5.4

A map representing the regular crime review process in Cambridge, Massachusetts, with housebreaks classified according to various time criteria.

Source: Cambridge, Massachusetts, Police Department. Reproduced by permission.

like global positioning systems (GPS) become more commonplace, we might expect the "traditional trio" of point, area, and line to be supplemented by an ever-richer array of raster data in the form of digital orthophotography and other photographic images. The wide availability of orthophotography (often commissioned by local governments) combined with the advent of inexpensive digital cameras and (still somewhat expensive) digital video recorders presages the fuller integration of all georeferenced "visual" data. Most likely, traditional point, area, and line maps will begin to be embedded with useful raster elements, so that the user will have

the choice of seeing a map or bringing up an orthophoto and/or a ground-level photo of the location of interest. (See chapter 6 for more on orthophotography applications.)

Other nontraditional applications include, for example, public safety events, in which police, fire, and other agencies are brought together in a common effort to alleviate a natural disaster. A map constructed for this purpose (figure 5.5) details data that provided general locations of police and fire units during a catastrophic flood in Dallas, Texas.

Ever-decreasing costs. Decreasing costs have brought mapping technology within the reach of agencies that would not otherwise have been able to acquire it. In the early days of the Information Age, equipment and software often cost more than the operator; now that situation is reversed. But the impact of less expensive technology goes deeper. Not only can agencies put computers on their workers' desks, but those computers are increasingly powerful and thus provide additional opportunities that slower or memory-challenged devices could not have accommodated. For example, very large raster files, unmanageable until recently, no longer pose as much of an access problem as they once did.

Crossjurisdiction alliances. The belief that "all politics are local" has inhibited collaboration between police agencies. The mantra has been that local problems should be solved locally, although the use of State or Federal dollars was acceptable provided not too many strings were attached. Unfortunately, offenders have not subscribed to the notion that they should recognize city, county, and State lines.

The following inconsistencies among law enforcement agencies have acted to make political boundaries "law enforcement opaque" rather than transparent or invisible, as criminals perceive them:

- Different radio frequencies.

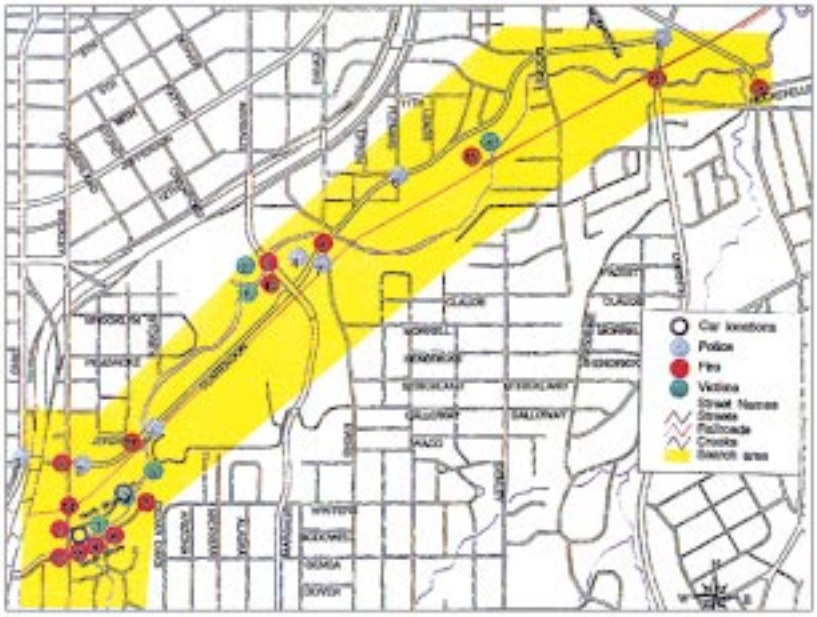

Figure 5.5

A map showing locational information relating to a flood in Dallas, Texas.

Source: Mark Stallo and the Dallas, Texas, Police Department. Reproduced by permission.

- Different protocols for hot pursuits.
- Agencies competing with one another in hot pursuits and investigations.
- Lack of information sharing and coordination between administrative units and/or agencies (referred to as "linkage blindness" by Rossmo, 1995).

Mapping has helped break down such barriers due to its power to provide visual evidence that criminal groups or individuals move across boundaries at will, sometimes intelligently exploiting the lack of communication between agencies. The increased interlinking of databases needs to be coupled with jurisdictional interlinking so that the official view of crime more closely corresponds to regional reality. Politically bounded areas, whether cities, counties, or States, rarely conform to social areas. Until policing areas more closely conform to or recognize social areas, crime analysis and prevention will be stymied to some degree. Crime mapping has tended to focus on technical issues, but the bigger picture—Are we mapping and analyzing the most appropriate areas?—also deserves attention. Crime can be a *regional* phenomenon. Regional problems call for regional solutions.

Theory and practice. Crime mapping is typically based on experience and observation, with a weak or nonexistent theoretical foundation. Empirical and theoretical perspectives battle each other in the here-and-now world of law enforcement. When tangible flesh-and-blood problems need to be taken care of immediately, theory is at best abstract, at worst completely irrelevant. But theory does have a place as a conceptual backdrop—a reference base that can provide consistency to our analyses and tactical responses. Eck (1997) pointed out that as the theoretical content of maps increases, it becomes easier to make sense of the data (see also Eck and Weisburd, 1995). In other words, if a map shows only crime locations, indepth explanation of pattern is next to impossible. But if other elements of context are included, such as the socioeconomic environment or locations of drug markets or of abandoned housing, (any elements that theory would lead us to expect to be linked to the crime pattern in some way), then understanding is likely to be enriched. For example, a CFS map, such as in figure 5.6, may be substantially more meaningful when the CFS are displayed along with housing code violations. "Negative" information showing where the anticipated link between conditions fails to apply may be just as useful as "positive" information showing where the link does apply.

Data sharing. Local and State governments are finding that data gathered by one agency might be valuable to others. This is not surprising, given the baffling complexity of social problems, including crime. Social scientists have long recognized that social systems are in some ways like natural ecosystems: change something and everything else changes to some degree. Land use patterns and changes, demographics, transportation system configurations, the weather, and the strength of social controls embedded in the culture—these and many more factors influence patterns of crime. It makes sense to give crime analysts access to the rich variety of data they need to help them answer the widely varied questions that come their way.

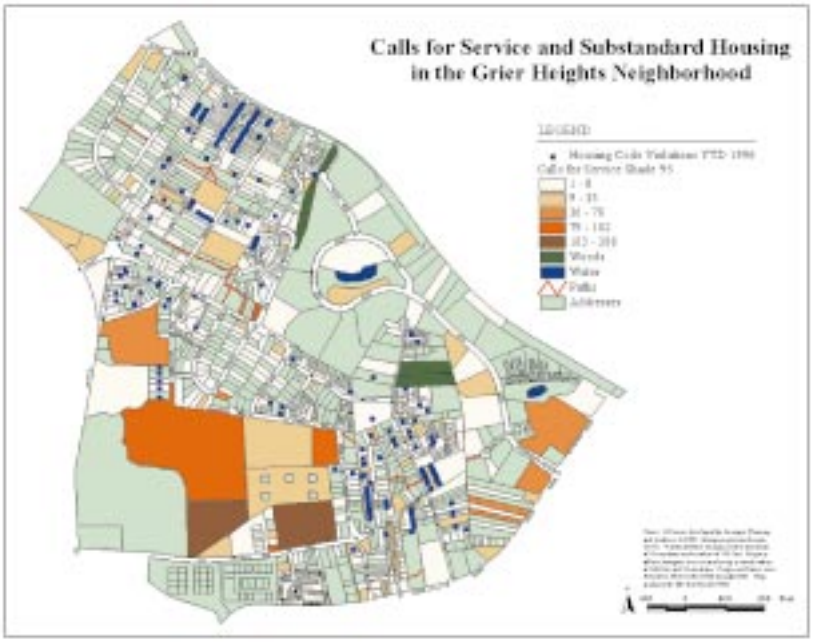

Figure 5.6

A map showing substandard housing and calls for service in the Grier Heights neighborhood, Charlotte-Mecklenberg, North Carolina.

Source: Elizabeth Groff and Charlotte-Mecklenberg, North Carolina, Police Department. Reproduced by permission.

Gradually, and inconsistently in terms of geography, "community" approaches to problem solving dictating collaboration and data sharing among agencies are gaining popularity.

Context. A relatively recent trend in crime analysis emerging from the community policing movement has been the increasing tendency to see crime "in context" rather than as a self-contained phenomenon with self-contained solutions. A broad view is needed, one that incorporates understanding of social background and crime patterns. Complete preoccupation with patterns and their immediate causes is a kind of professional shortsightedness that may miss fundamental causal processes (see Sherman et al., 1998, for more on the broad view of crime prevention). Crime analysis that ignores this wider perspective, or backdrop, runs the risk of ignoring important connections to community-based processes. This again reinforces the importance of making a variety of data available to police officers and crime analysts alike.

Privacy issues. Privacy questions are touched on elsewhere in this guide, but they also deserve a mention in any discussion of synthesis. In marked contrast to the cultures of many other developed nations, U.S. culture is quite resistant to government intrusion, even when that intrusion seems to be well intentioned and in the apparent best interest of the majority. Along with this goes a degree of mistrust of law enforcement, a posture reinforced by high-profile events such as the Rodney King affair in Los Angeles, the Abner Louima incident in New York City, and the Branch Davidian standoff in Waco, Texas. Fears of privacy violations by law enforcement are only part of broader societal concerns about privacy and the inherent mistrust of authority.

These concerns were exemplified by the controversy surrounding the activities of

Image Data, LLC, a small New Hampshire company that in 1999 attempted to build a national database of driver's license photographs, ostensibly to combat check and credit card fraud. After Colorado, Florida, and South Carolina had contracted to supply their license pictures, it was discovered that the photo file was also to be used to combat immigration abuses, terrorism, and other identity-related crimes. It then became known that Congress had contributed $1.5 million to the effort and that the U.S. Secret Service had lent a hand, elevating the controversy to new heights and provoking initiatives from the three States to cancel their contracts (O'Harrow and Leyden, 1999; for a more detailed analysis, see Paisner, 1999).

This type of data gathering is one of many ways in which data relating to individual persons, families, or households can be accessed and compiled. The use of branded credit cards and discount cards in stores enables retailers and marketing companies to track every purchase and develop spending profiles of consumers. When information from this kind of database is added to information that can be accessed via directories, maps, remotely sensed imagery (e.g., aerial photos, satellite images), and various and progressively more integrated public records, anxiety about privacy violations, real or imagined, understandably escalates.

Crime mapping can be seen as a piece of this privacy issue, although whether one elects to put a sinister spin on the technology is obviously a personal decision. As yet, no conspicuous backlash against crime mapping has occurred (with the possible exception of Megan's Law), but whether this type of public reaction will occur in the future is an open question.

Public access. Conflict over privacy and access is inevitable. For every person or group that lobbies to restrict the dissemination of crime-related information, another lobbies to gain more access. Surprisingly, access to crime data is still denied to researchers on occasion. Denying bona fide researchers access for projects that are ostensibly in the public interest clouds confidence in the data-gathering process, since it inevitably raises questions about the reasons for denial of access.[2] As noted elsewhere, it would seem that most crime data eventually are released to the public through court proceedings and so on. What could be damaging and should obviously be avoided is making unfounded data accessible to the public (e.g., on the Web), since it carries the accompanying risk of defaming the innocent.

A controversial development in recent years has been the tendency of some States to put lists of sex offenders on the Web, Virginia being the 10th State to do so in late 1998. The names of more than 4,600 violent sex offenders were made available to the public, with the effect of "giving parents a new tool to protect their children but also renewing fears about the erosion of privacy in the Information Age" (Timberg, 1998).

The names, ages, home addresses, conviction records, and photographs of Virginia offenders are listed at *http://www.vsp.state.va.us*, a Web site that recorded more than 650,000 visitors in less than 2 months after it was

launched. Predictably, State officials were enthusiastic about the site, while civil libertarians suggested that it amounted to double punishment, with the additional possibility that offenders' children would be put in jeopardy. Other potential risks include the possibility of disseminating false information (from computer hackers or errors in the original files) and vigilantism. To date, registries have not been evaluated adequately, but they are greeted with enthusiasm by parents anxious to protect their children.

Many law enforcement agencies have developed Web sites displaying crime maps (see appendix and various examples throughout this guide). Some elect to show crimes in the form of point data, while others use *choropleth* or shade maps. Sharp differences of opinion have been voiced over the appropriateness of such maps. Opponents fear negative consequences for high-crime communities; under the worst case scenario, crime maps may provoke full-scale flight from neighborhoods. Proponents tend to be community-policing advocates who see full disclosure of information as a tool in crime prevention. They see Web-based maps as community resources providing citizens with unbiased, ready access to crime patterns. If citizens can see where crime is, the argument goes, they will be better collaborators in crime prevention.

Mapping applications for the millennium

Crime mapping can be applied to the following criminal justice areas: criminal intelligence, crime prevention, courts and corrections, public information, and resource allocation and planning.

Criminal intelligence

Building criminal cases can be a painstaking process involving the compilation of information from diverse sources. All the data have a geographic dimension, although the importance of the locational information varies from vital to unimportant. Spatial data may provide answers to obvious questions about the crime scene, such as, Where is it?, but they also provide information for less obvious questions, such as, Where is this crime scene in relation to other relevant persons or objects? What locational information can be derived from victims, offenders, and witnesses? Can the geographic data be codified in the form of a map, and, if so, would such a map be useful to investigators? Investigators might map links between a suspect and his or her associates' home addresses to identify where the suspect's daily or weekly activities take place—the *activity space*. Another possibility would involve mapping gang graffiti as a way of defining gang territory.

Geographic analysis may be helpful on radically differing scales. For example, very large scale, or high-resolution, GIS could help with representing spatial data at crime scenes, such as the arrangement of objects in various rooms in a house or the pattern of crime in a highrise building in three dimensions (for more on this, see chapter 6). Other data may be better represented on a small scale—for example, facts relating to suspect movements in other cities or states. Depending on the

importance of spatial information, a mini-atlas could be compiled, bringing together all the known geographic information and putting it in the context of other data.

Moland (1998) describes a case study in crime mapping in which a "cellular phone trail" was left by one suspect, providing an opportunity to plot spatial and temporal paths of two suspects. Detectives worked with telephone company technicians to verify that various antenna locations were working and to establish various aspects of cell phone signal patterns. One of the key pieces of evidence presented in court was figure 5.7, which shows cell phone antenna locations associated with the suspects' activities. This example illustrates not only the use of mapping to develop criminal intelligence, but also the use of mapping to develop courtroom evidence. The two men ultimately were convicted and sentenced to life in prison for a gruesome murder. Maps in the courtroom helped the prosecution walk the jury through a complex set of events by illustrating the collateral spatial relationships.

The information shown in figure 5.8 could also be used to document a pattern showing where and when incidents occurred based on the times of the related calls for service, as well as to provide information to corroborate information from witnesses.

As with any new technology, the risk of overselling GIS may lead to unrealistic expectations and dashed hopes. The best case scenario would include GIS as a useful contributor to the investigative process (see also the section titled, "Geographic profiling," in chapter 6).

Crime prevention

In a publication titled *Preventing Crime: What Works, What Doesn't, What's Promising*, Sherman et al. (1998) document "what works" for 11 crime problems. They identify approximately 30 actions or conditions as "promising."

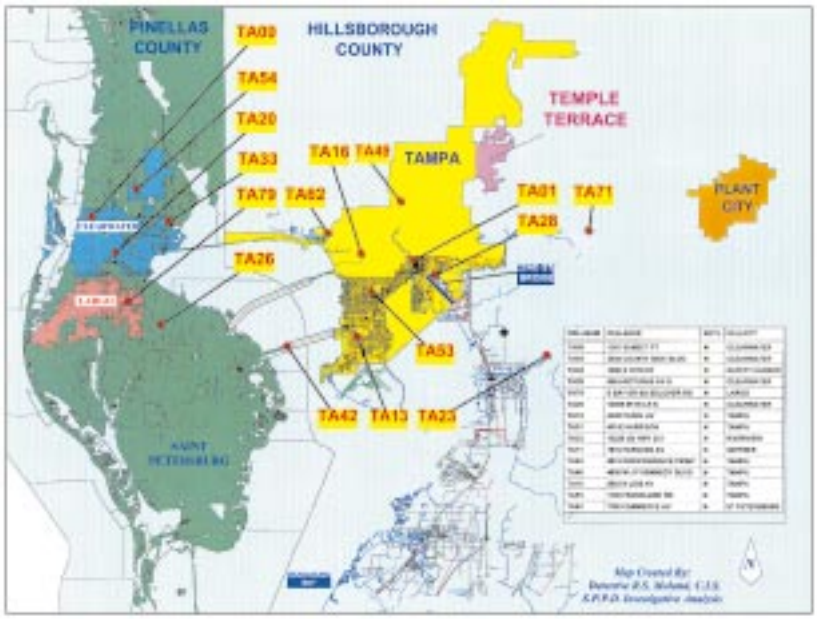

Figure 5.7

A map showing key telephone antenna locations delineating two suspects' activity.

Source: Robert S. Moland, St. Petersburg, Florida, Police Department. Originally published in Moland, 1998, figure 3. Reproduced by permission.

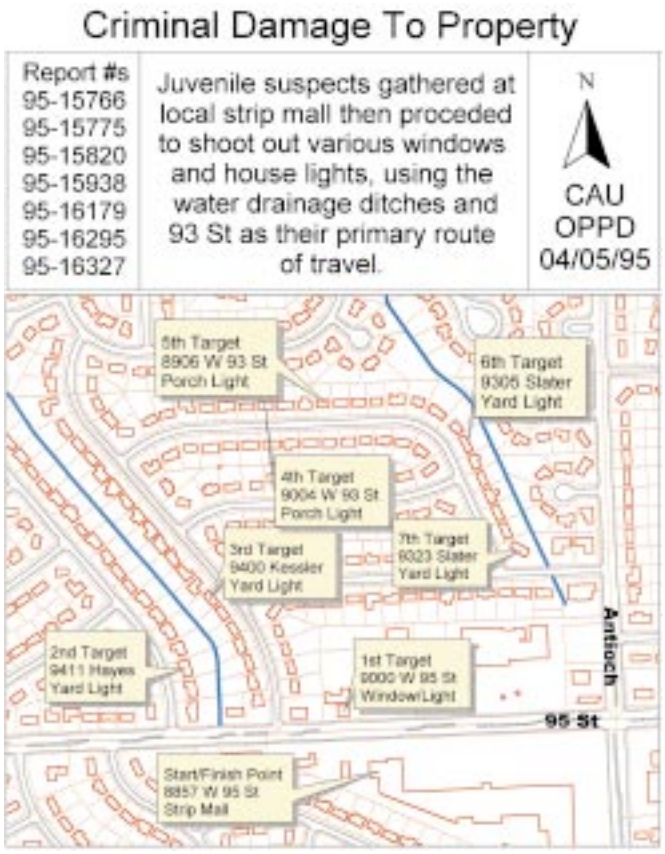

Figure 5.8

A map showing a pattern of criminal damage to property, Overland Park, Kansas.

Source: Gerald G. Tallman, Manager, Crime Analysis Unit, Overland Park, Kansas, Police Department. Reproduced by permission.

What is interesting about these lists is that many of the actions had little or nothing to do with policing. Many were amenable to the application of mapping tools, whether they were related to crime or other phenomena. This finding underscores that the label "crime mapping" is much too narrow a designation for what police departments do.

While some crime prevention actions were in the domain of schools or social service agencies, such as frequent visits by nurses to the homes of mothers and infants at risk, some were more directly connected to policing and had locational components that lent themselves to the application of geographic tools:

- **Nuisance abatement action on landlords of rental housing plagued by drug dealing.** Where are the landlords? Where are the subject properties? What properties does a certain landlord own across a city? Once mapped, how can nuisance abatement action be planned to make the best use of both time and space resources? Can a network analysis program be used to optimize visits to properties?

- **Extra police patrols for high-crime hot spots.** Where are the hot spots? How can patrol resources be optimized so that the patrol presence is proportional to the severity of crime in the hot spot? (Hot spots could be evaluated in terms of responses that allocate a

fair share of the resources available on a given shift.)

- **Monitoring of high-risk repeat offenders by specialized police patrols.** Where do released repeat offenders live? What does this pattern look like? Can repeat offenders be categorized or prioritized by the degree of risk they present, including the risk of repeating and the potential severity of the crimes they are likely to commit based on their histories?

- **On-scene arrests for domestic abusers who are employed or who live in areas where most households have an employed adult.** Where are the salient locations? What are the home and work addresses of offenders? Can information on the current whereabouts of offenders and other locational data be maintained in a periodically updated registry?

- **Therapeutic community treatment programs for drug-using offenders in prison.** This action recommendation reflects the work of Harris, Huenke, and O'Connell (1998). They used mapping to increase released offenders' access to services in Delaware, plotting locations of substance abuse, mental health, employment, and other social services, and relating them to the most recent addresses of probationers or parolees.

An example of a crime prevention program using geographic data in creative ways is the *autodialer* system employed by the Baltimore County Police Department in Maryland (Canter, 1997, 1998). Analysts subjectively identify clusters of incidents that have similar modus operandi and occur relatively close to one another (figure 5.9). Then a GIS is used first to randomly select telephone numbers in the ZIP Code area coinciding with the area under analysis, and second to further narrow down the numbers to the general area of the crime hot spot. The autodialer then calls all the telephone numbers on the list with a message from the police department relaying precautions to take and asking for reports of suspicious behavior. Experience shows that because some displacement of crime seems to occur, target polygons or areas must be expanded to take this displacement into account. Evaluation of the system suggests that it influences the actions of the community, the offender, and the police. Community awareness appears to heighten (911 calls reporting suspicious persons and vehicles increase significantly), and crime appears reduced, in spite of the moderate displacement effect.

Courts and corrections

Crime mapping can be applied to the following courts and corrections areas.

- **Probation officer service areas.** Caseload distributions can be managed by looking at the geographic location of probationers and parolees, and then using a mapping program, such as the ArcView Network Analyst, to determine the most efficient route for sequencing visits to homes, should visits be part of the designated probation officer's duties. If visits to individuals have to be made at specific times, a route can be designed to minimize time

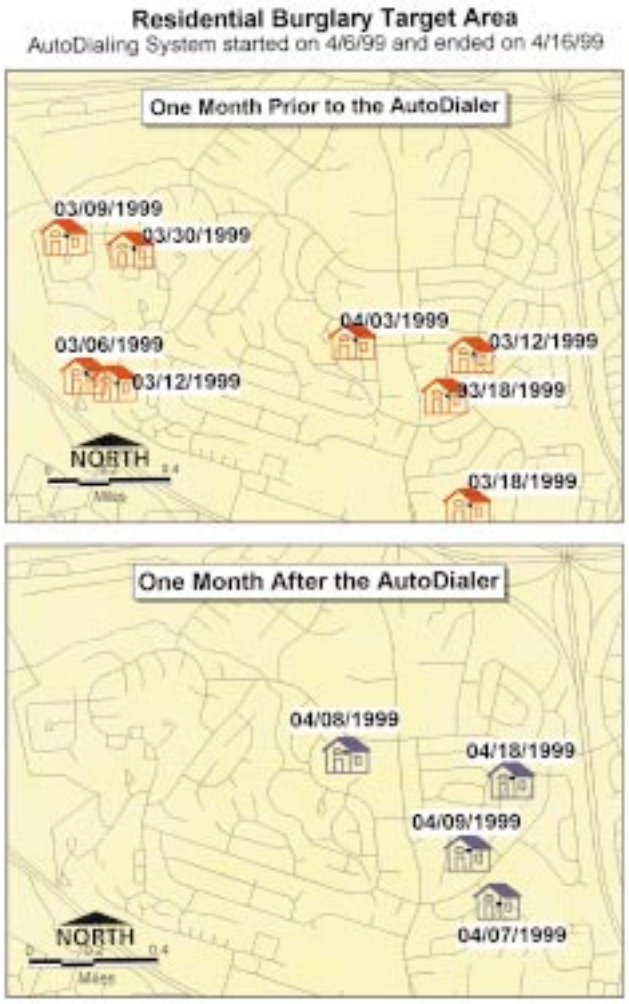

Figure 5.9

A map showing a residential burglary target area before and after autodialing.

Source: Philip Canter, Baltimore County, Maryland, Police Department. Reproduced by permission.

spent traveling from one address to the next. If time is not a factor, a route to minimize overall travel time can be determined (figure 5.10).

With the development of community probation, officers are now more likely to be assigned to small community areas so that they have closer contact with probationers and community resources, including police. A program, such as MapInfo® Redistricter, could be used to draw (and periodically redraw) districts based on the distribution of caseloads. Similarly, districts could be drawn to equalize workloads for serving warrants. Other applications in the probation field could include mapping dangerous areas where probation officers should be accompanied by a police officer or mapping areas that probationers are to avoid (figure 5.11).

- **Prison location analysis.** Prison building, a booming industry in recent decades, frequently runs into the NIMBY (not in my back yard) problem. Almost everyone agrees that prisons have to be built, but few communities (with the exception of rural locations desperate for jobs) want them next door. Prison location analysis is a specialized application of GIS. Location modeling has actually been in use

Figure 5.10

A map showing a route designed to minimize travel time between points determined by the ArcView® Network Analyst mapping program. The program can also print street directions.

Source: Keith Harries.

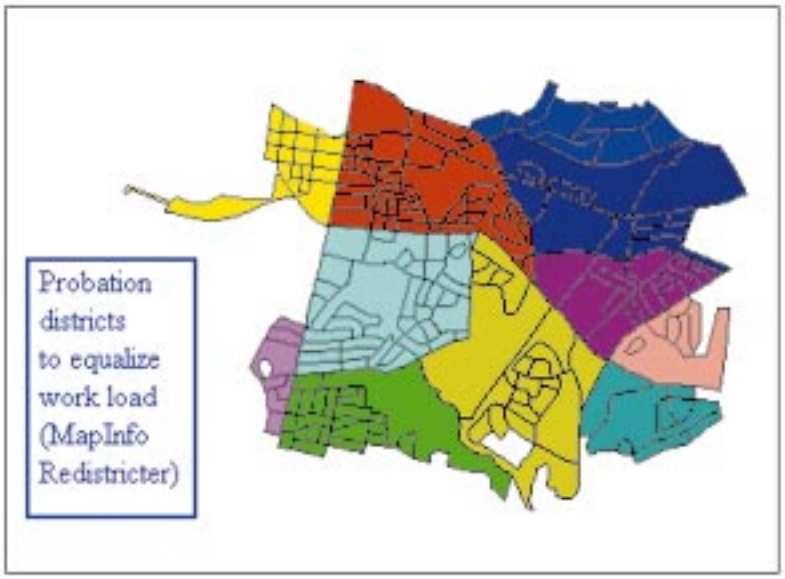

Figure 5.11

A map showing community probation districts mapped to equalize workloads using MapInfo® Redistricter.

Source: Keith Harries.

for some time. The basic approach involves mapping vacant and redevelopable land as possible sites for building, then adding layers for exclusions (due to factors such as terrain, prohibited land uses, lack of utilities, and lack of adequate transportation links) to identify the sites with the greatest potential for development. These sites can then be reviewed and prioritized with further map analysis or field investigation.

Another locational criterion could be the site's distance from communities supplying the majority of inmates. Prisons far from their feeder communities make visitation difficult and may fragment families. Minimizing travel time may be a consideration not only for families, but also for the department of corrections and the court system, because transporting prisoners to and from remote court offices will increase travel time and cost. The accessibility of a prison to a courthouse

can be evaluated using ArcView Network Analyst (figure 5.12).

- **Probationer and parolee locations.** The mapping of home addresses of parolees and probationers, along with modus operandi data, enable law enforcement to quickly identify local parolees as potential perpetrators of particular crimes occurring in a neighborhood. This type of analysis is an integral part of the increasingly popular ComStat (computerized statistics) process that originated with the New York City Police Department, in which precinct commanders are quizzed regularly about crime patterns in their areas. A big screen monitor linked to a GIS can immediately show parolee locations in conjunction with offense locations (see chapter 3). Recidivism could also be mapped to identify hot spots and mobilize resources necessary to deal with the issue. Parole and probation agencies are rich in locational information that can be used to manage caseloads, including sex offender registries (figures 5.13 and 5.14).

- **Halfway house locations.** Much like prisons or group homes for mentally disabled people, halfway houses provoke NIMBY reactions. Mapping demographics and housing types may help with site selection. In an example cited by Westerfeld (1999), a Baltimore community needed to be persuaded that halfway houses were appropriate in its neighborhoods. The strategy that was developed involved geocoding the home locations of all Maryland prison inmates originally from the community in question. Maps then showed where each inmate had lived. During community presentations, it became increasingly difficult for residents to oppose receiving people who originally resided in their neighborhoods.

However, publicity about the high number of escapes from halfway houses in some jurisdictions compounds the difficulty of locating such facilities. One solution is to seek a zoning variance to permit residential facilities in what are otherwise industrial or commercial areas. Presumably, this is a last resort.

Figure 5.12

A map showing accessibility to a central point. Three zones, each representing a specific travel time are mapped using ArcView® Network Analyst.

Source: Keith Harries.

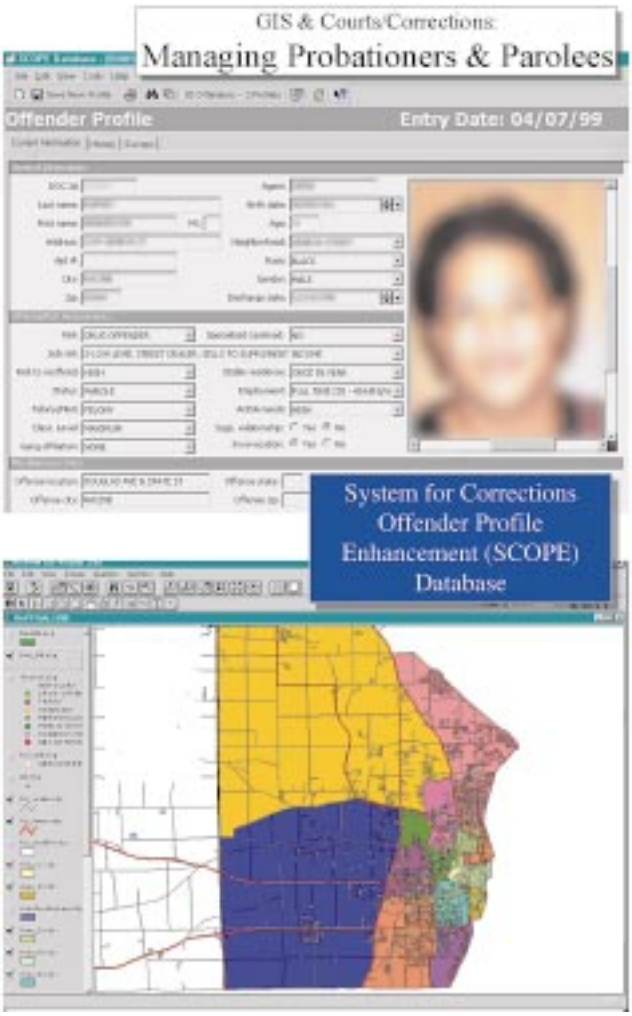

Figure 5.13

An offender profile and a draft map of offenders in various categories. (Details intentionally obscured.)

Source: Eric Kim and the Wisconsin State Department of Corrections. Reproduced by permission.

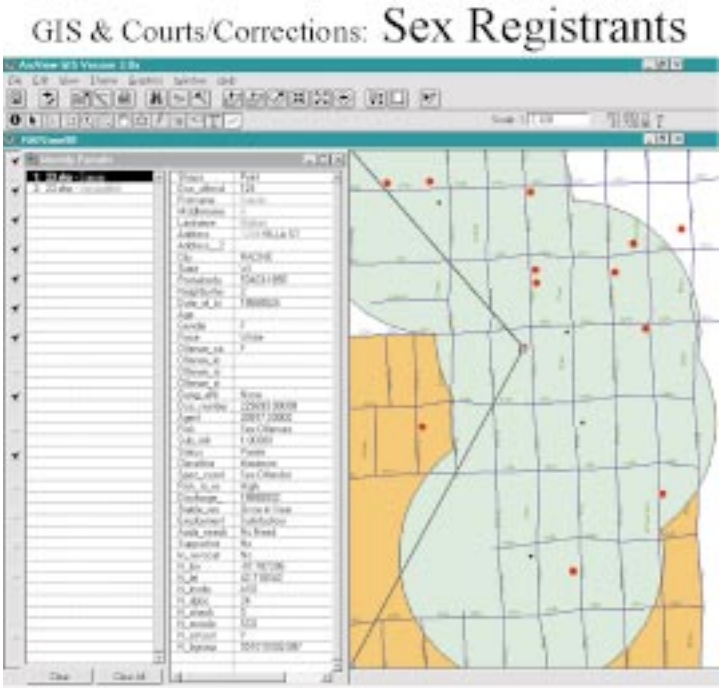

Figure 5.14

A draft map of buffers around the locations of sex registrants.

Source: Eric Kim and the Wisconsin State Department of Corrections. Reproduced by permission.

A cynical solution suggests that poor, dysfunctional communities are likely to be incapable of mobilizing themselves politically so as to make the locating of halfway houses relatively free of opposition.

- **Offender access to services.** A Delaware study (Harris, Huenke, and O'Connell, 1998) analyzed the availability of rehabilitative services for released offenders, looking at the spatial relationship between former inmate addresses, substance abuse treatment facilities, social service centers, mental health services, and unemployment offices. Nearly half of all released prisoners in Delaware return to prison within 3 years, leading to the conclusion that postprison rehabilitation services are inadequate, or at least inaccessible. Maps were used to justify the implementation of drug rehabilitation services in Kent County and the city of Dover.

- **Sentence mapping.** A mapping application used occasionally by court systems deals with the need to ensure fair sentencing. Although judicial discretion has been reduced by mandatory sentencing, it has not been eliminated (and never will be, of course), and substantial disparity remains in the sentencing of similar people for similar crimes. Like police agencies, courts in both the State and Federal systems have territories. The mapping of sentences is more technically challenging than mapping crime incident data. However, it can be done using, for example, a weighting system that assigns higher weights to more severe sentences, making sure that analysis of offender characteristics and crime types is properly controlled for. (For details on this concept and examples of geographic analyses of sentencing, see Harries and Lura, 1974, and Harries and Brunn, 1978. For a discussion of geographic issues specifically relating to capital sentencing, see Harries and Cheatwood, 1997.)

- **Courtroom presentation.** As noted in the discussion of figure 5.7, maps showing sequences of events and patterns can be used in court to provide an easily comprehended visual rendition of a criminal process. Such presentations may be constructed on any scale, from international drug trafficking to the layout of a murder scene in one room of a building. In figure 5.15, the information on a sequence of events involving sexual torture and hostage taking was mapped to provide the prosecution with a plausible chronology of events that could be readily communicated to judge and jury.

Public information

"Public information" is a phrase that evokes mixed emotions in police departments. Some make vast amounts of data readily accessible to the public through the Web, while others are reluctant to have a Web site at all, let alone include crime data on it. At the risk of stereotyping, it could be suggested that the more defensive posture tends to reflect "old school" thinking, whereas willingness to share data represents a more contemporary, "let the light shine in" approach, consistent with community policing values.

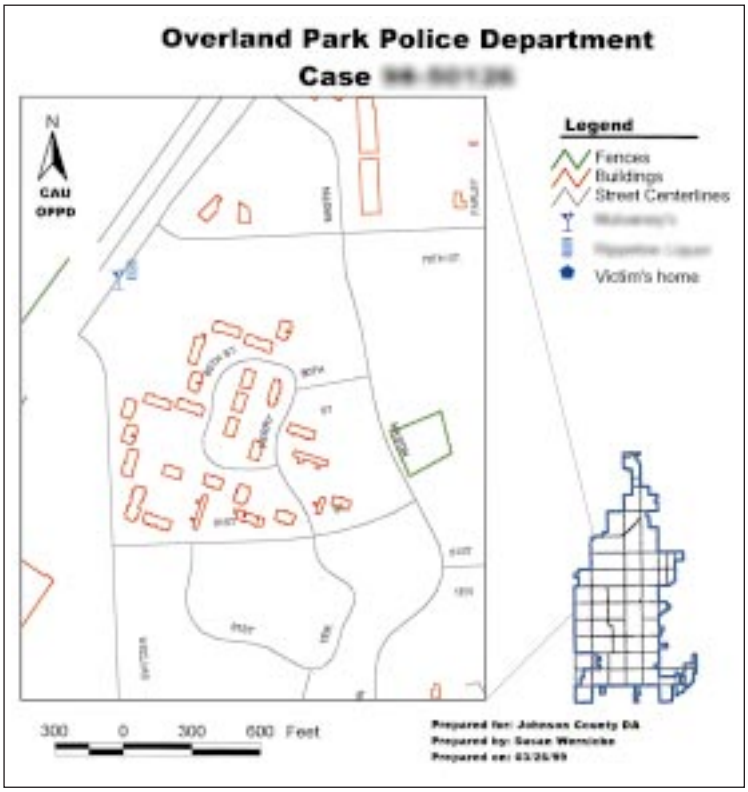

Figure 5.15

An example of a map used in court in Overland Park, Kansas, to substantiate the times the victim reported she was in certain places. The victim's address and other details have been modified or erased to protect the privacy of the victim in this case.

Source: Susan Wernicke, Overland Park, Kansas, Police Department. Adapted by permission.

Even the most avid proponents of data access would concede that cases with ongoing investigations should be exempt for obvious reasons. However, beyond active cases and cases involving rape victims and juveniles, active concealment is difficult to justify. From a public policy perspective, one of the strongest justifications for open data access is that it makes putting a "political spin" on things somewhat more difficult. Every agency, at every level of government, wants to make itself look good, and to this end information is power. Limit information dissemination and the power of the opposition is crimped.

Some public constituencies also prefer to suppress crime data, and particularly crime mapping data, from public view for fear that their investments will be negatively affected. Such considerations seem of particular concern to realtors and some property owner's associations. The rationale is that any publicity about crime tends to depress property values. But what is overlooked is that publicity about crime may draw more attention to the problem with the possibility of remedial action. In this context, the possibility of long-term gain is sacrificed for short-term expediency.

The more prevalent perspective today is that an informed public can best assist law enforcement, given that police cannot be in all places at all times, and that policing will be most effective when it is performed in an environment in which the public offers active support. Clearly, maps are tools that can assist in this effort through their use at community meetings and their distribution to the media, citizen patrols, and neighborhood groups. However, maps must be tailored to each group, and a poorly designed or poorly presented map may do more harm than

good by creating confusion where none may have existed before.

Internet media offer public information opportunities that go beyond merely having a Web site or providing maps. The Web also offers opportunities for feedback from the public via survey forms that solicit information about specific crimes or problem areas and neighborhood-specific bulletins. A review of police department Web sites linked through the Crime Mapping Research Center Web site (see appendix) demonstrates some of the many possibilities.

Resource allocation and planning

As noted in chapter 3, the fundamental principle behind resource allocation is the efficient assignment of valuable resources. In theory, at least, more resources should be assigned to areas where crime is most prevalent. It was suggested in chapter 3 that calls for service be used as either a crude or weighted index to help determine the allocation of patrol resources on a per-shift basis. A choropleth map of neighborhoods classified by their levels of CFS could be the tool used for planning resource allocation.

In a community policing context, this approach can be expanded by looking not only at the calls for service themselves, but at the local social conditions associated with high levels of CFS. This not only forms a foundation for planning direct law enforcement strategies, but also sets the scene for cooperation with other criminal justice system agencies and social service agencies. An example of this approach, applied in Cincinnati, is shown in figure 5.16. The choropleth map of calls for service by neighborhood and analysis of social indicators showed that the prevalence of nonowner-occupied housing was the strongest social correlate of CFS levels. Models that relate social conditions to levels of crime or CFS take many different forms, and examples can be found in the literature on the social ecology and geography of crime (Felson, 1998; Byrne and Sampson, 1986; Harries and Powell, 1994; Harries, 1995; Taub, Taylor, and Dunham, 1984; Bursik and Grasmick, 1993; and Rose and McClain, 1990).

Crime analysis and the census

Postings on the Crime Mapping Research Center's listserv indicate that the manipulation of census data is a confusing obstacle for many analysts. This is not surprising, since census data and census geography are somewhat complex, or can be, depending on what you are trying to do. Among the most problematic areas are linking census geographies to data and misunderstandings relating to what can reasonably be, and not be, done with specific census "counts" and variables.

For example, what measure of income should be used? The census contains data on *family* income and *household* income. Families are subsets of households, so these data for families exclude single persons living alone or unrelated persons living together (who constitute households). Family income will be higher than household income because the average family has more wage earners than the average household. Normally, because

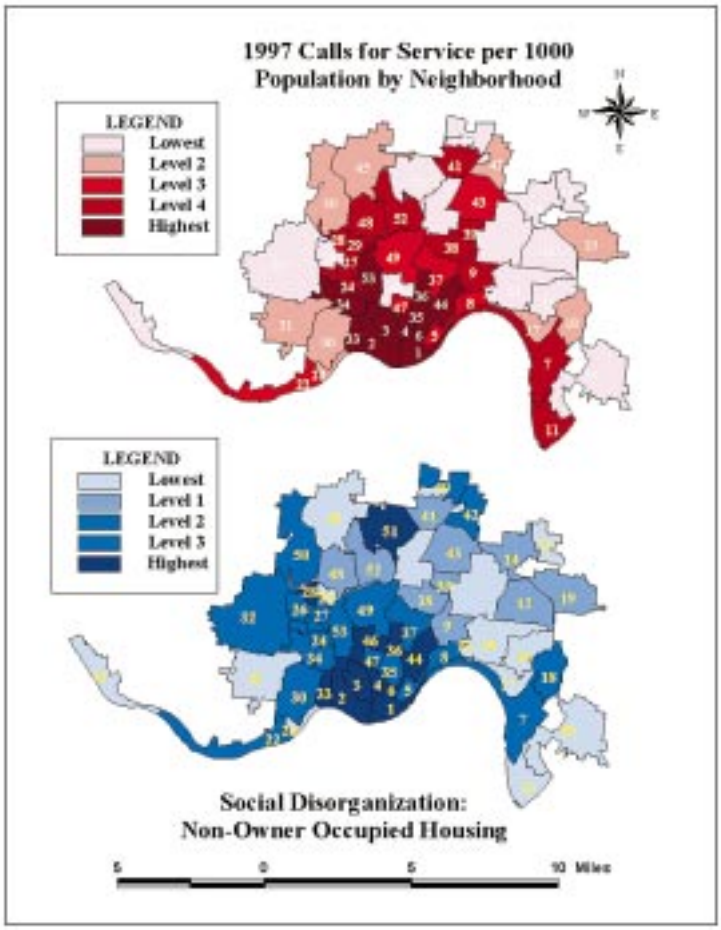

Figure 5.16

(Top) A map showing calls for service in 1997 per 1,000 people by neighborhood in Cincinnati, Ohio. (Bottom) A map showing nonowner-occupied housing, which can be used as an index of possible social disorganization.

Sources: Shape files and analysis by A. Ball, COPS Regional Institute, and M. Neumann, Cincinnati, Ohio, Police Department. Adapted by permission.

it is more inclusive, the preferred measure is household income.

A second question arises: Is it best to use *median* income or *mean* income? The mean has the advantage of being able to be manipulated mathematically, but in a skewed distribution, such as is found with income, the mean may be "pulled" to the right by the very high values of the extremely rich (the so-called Bill Gates Effect!). For such skewed distributions, the median is usually preferred since it gives a more accurate description.

Detailed treatment of these questions is beyond the scope of this guide. An excellent review of issues in census geography and the analysis of change using census data can be found in Myers (1992).

Conclusion

Mapping criminal justice elements is well advanced, although unevenly distributed among police agencies. Most applications are horizontal, which is to say within the various levels of the criminal justice system. The real challenge is to integrate mapping applications vertically, so that agencies can be linked according to specific problems and be regionally integrated. This is a tall order given the political insularity of agencies and turf and control issues. The perfect world of analysis and mapping might look something like table 5.1. Ideally, mapping applications would be integrated to permit automated multi-step analyses. Quite apart from political impediments to data integration, technical obstacles can make integrated analysis

Table 5.1. Horizontal and vertical linkages in analysis and mapping among criminal justice entities

Agencies	Current Mode	Ideal Mode	+ Region
Law enforcement	Independent analysis		
Courts	Independent analysis		
Corrections	Independent analysis		

Source: Keith Harries.

quite cumbersome because many *spatial joins*, which link databases according to their geography, are needed to indicate how records relate to geographic areas.

Summary

Chapter 5 has explained:

- The characteristics of crime mapping for the new millennium.
- How crime mapping can be applied to:
  - Criminal intelligence.
  - Crime prevention.
  - Courts and corrections.
  - Public information.
  - Resource allocation and planning.
- Where to obtain a better understanding of census geography and analysis.
- How crime mapping applications could be broadened to improve their effectiveness.

Notes

1. Personal communication from Michael Ratcliffe, U.S. Census Bureau, Population Division, January 25, 1999.

2. While most law enforcement-academic collaborations are amicable and productive, this is not always the case owing to the vagaries of human nature that occasionally leave either or both parties feeling used and abused. As in other relationships, the key to success seems to be the unsurprising revelation that all parties should be sensitive to the others and avoid exploitive actions.

What's Next in Chapter 6?

- *Types of changes that may be expected in the next decade.*
- *Geographic profiling.*
- *High-resolution GIS.*
- *The use of complex statistical methods in spatial forecasting.*
- *Aerial photography.*
- *How various kinds of data visualization can be integrated productively.*
- *GIS and global positioning systems (GPS).*
- *The possibility of limits to data access.*
- *Applications of multimedia and integration technologies.*